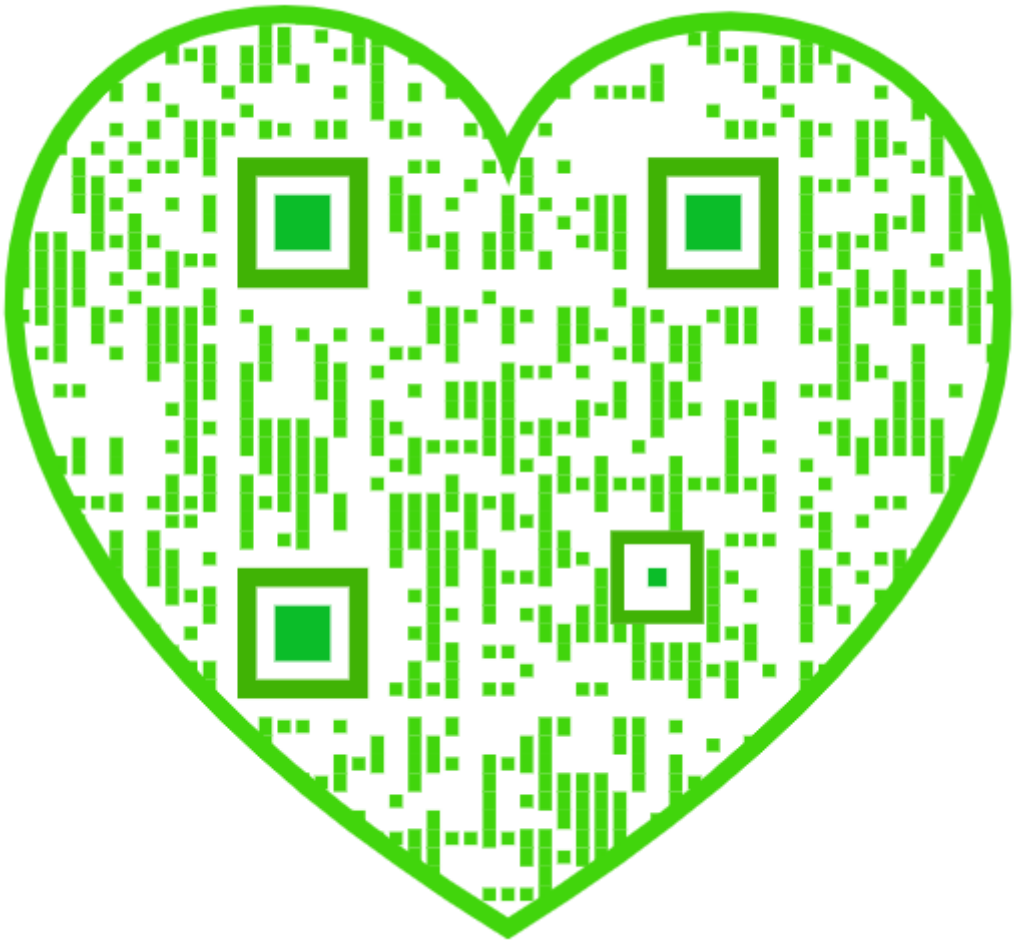
MORTON

ON THE

INHALATION

OF

SULPHURIC ETHER.



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REMARKS

ON THE

PROPER MODE OF ADMINISTERING

SULPHURIC ETHER

BY INHALATION.

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TO THE

SURGEONS OF THE MASS. GEN. HOSPITAL,

THIS LITTLE WORK IS RESPECTFULLY DEDICATED,

AS AN EVIDENCE

THAT THEIR EARLY AND CONTINUED INTEREST IN THE ADMINISTRATION OF SULPHURIC ETHER

IS GRATEFULLY APPRECIATED,

BY THEIR

OBT. SERVT.

WM. T. G. MORTON.

REMARKS.

ALTHOUGH various publications have appeared since the new application of sulphuric ether was discovered, which have made it evident that it can be used, both safely and effectually, for the relief of much of the suffering to which the human race is liable, I believe that a manual, containing an account of the mode of administering it, the effect which it produces, the symptoms of insensibility, the difficulties and dangers attending its use, and the best means of obviating and removing these, as far as possible, is still a desideratum. This is particularly the case with those who have not had an opportunity to witness its administration, but who may wish to make use of it in their own practice. To supply this want, and to avoid the necessity of replying to the letters

frequently addressed to me for information upon these subjects, the following pages have been written. To those who have used the ether, many of the directions may appear tediously minute; but, to those who have not, they will afford desirable information.

In the first place, it is of the utmost consequence that the ether which is used should be not only free from all impurities, but as highly concentrated as possible; as some of these impurities would prove injurious if taken into the system, and as, of course, the stronger the ether, the sooner the patient comes under its influence. Unrectified sulphuric ether contains, as impurities, alcohol, water, sulphurous acid, and oil of wine; and is unfit for use internally.

In order to make it fit for inhalation, unrectified sulphuric ether must be redistilled, and washed, and then dried with chloride of calcium. This will free it from the impurities above mentioned, and render it more concentrated than the original article.

To explain the process of preparing pure sulphuric ether is not, however, the object

of these remarks; but, rather, to state how it may be best used after it has been prepared. I shall, therefore, dismiss this part of my subject with the assurance that, if any one wishes to attain success in the administration of ether, he must, in the first place, provide himself with that which is not only freest from impurities, but also most highly concentrated. And, as I believe that establishments which manufacture a large quantity of ether can not only produce a better article, but can also afford it at a less price than it would cost individuals to prepare small quantities for themselves, I think any one wishing to use it will find it for his advantage to purchase it of those druggists who have it purified expressly for inhalation.

The next point I have to treat of is the best mode of administering ether. The earliest experiments were mostly made by pouring ether upon cloths, and inhaling it from them. The results obtained in this way were somewhat uncertain, and not always satisfactory, and this mode of administering it was, before long, exchanged for

that by means of an apparatus, which rendered the experiments more uniformly successful. Some alterations and improvements were afterward made in this apparatus, but, substantially, it remained the same as long as it continued in use; and, as many persons may read these pages who have never seen the apparatus, or one like it, a few words by way of description will not, perhaps, be unacceptable.

The apparatus first used consisted of a glass vessel, about six inches square, with rounded corners; one opening, two inches in diameter, was left on the top through which a sponge was inserted and the ether poured, and another, an inch and a half in diameter, on one side for the admission of external air. On the side opposite the last-named opening was a glass tube, two inches in diameter, and an inch in length, terminating in a metal mouth-piece three inches long,* and of the same calibre as the glass tube. This mouth-piece was provided with two valves, one covering a circular opening, three

* In the early administration of ether, I sometimes made use of a flexible tube, about four inches long, with a mouth-piece at its end; but I soon discontinued the use of this, as patients were not so soon brought under the influence of the ether, when at this distance from the apparatus.

quarters of an inch in diameter, on the top, and the other extending across it. These valves were so arranged that, when the patient filled his lungs, the upper valve shut down, closing the aperture in the top of the mouth-piece, while the one across the mouth-piece opened and allowed the ethereal vapor, mixed with atmospheric air, to pass into the lungs; and, when he emptied his lungs, the pressure of the expired air closed the valve across the tube, while the same pressure opened the upper valve, and allowed the vapor, which had been once breathed, to pass into the room, instead of returning into the reservoir. Thus, at each inspiration, the patient had a fresh supply of air thoroughly charged with the vapor of ether, which vapor was continually given off by the sponge which was placed in the reservoir and thoroughly saturated with ether.

This apparatus answered the desired purpose, and, with some unimportant alterations, was the one used by me in my own practice, by the surgeons of the Massachusetts General Hospital, and others who administered ether in this country* until the

* Several kinds of apparatus for inhaling ether, in which more or less ingenuity has been displayed, have been constructed in Europe; but, as the sponge seems to be destined to supersede them all, no further notice of them is deemed necessary.

early part of April last, when it was found that, if a sponge well saturated with ether was placed over the nose and mouth of a patient, so that all the air which he breathes must necessarily pass through it, he was brought as completely under the influence of the ether, and in about as short a time, as if he had breathed it from the apparatus. Further experience having fully established this fact, and, as that which will produce a desired effect in the simplest and cheapest manner is always to be preferred, the sponge will, probably, before long, be in general use, in preference to any "inhalers," however ingeniously contrived.

Although it may excite some surprise that I thus unceremoniously dispose of instruments, many of which evince much care and ingenuity, a little consideration of the facts of the case will show that there is good ground for my assertions. The vapor of sulphuric ether, as is well known, will not support life in its pure unmixed state, being destitute of oxygen; and fears were entertained, when it was first applied to its present

use, that, unless extreme care was taken to supply the patient with a large amount of atmospheric air, not enough oxygen would enter the lungs to decarbonize the blood, and change it from venous to arterial; venous blood would then be sent to the brain, and the patient die from asphyxia, in the same manner as when deprived of oxygen by immersion in water, or from any other cause. Attention was immediately turned to this point, and, in all the inhalers which have been constructed, apertures, of greater or less size, have been left for the admission of external air. There is, however, one fact which renders it a matter of extreme difficulty so to arrange the apertures that a sufficient supply of atmospheric air shall, in every case, be afforded to the patient. This is, that a given amount of ether will not, under all circumstances, afford the same quantity of ethereal vapor; the amount produced by evaporation of the ether being much greater in warm weather than cold. Thus, an apparatus, the aperture of which is amply sufficient for the admission of ex-

ternal air when the thermometer stands at 65°, and which may be used with perfect safety at that temperature, becomes positively dangerous with the thermometer at 90°, although the same aperture is left open, and the same quantity of ether used. This danger is completely obviated by using the sponge; for, however high the temperature may be, and however great the consequent evaporation of ether, the patient has always a full allowance of atmospheric air; as the ethereal vapor, instead of being confined in the reservoir of the apparatus with no outlet but the air-hole and the mouth-piece, escapes freely into the room, and the patient breathes but little, if any, more of it than under ordinary circumstances. The sponge, too, has another advantage which, practically speaking, is of no small importance. This is, that, when the ether is given by a sponge, there is much less disposition to cough on the part of the patient than when it is given by the apparatus. This is owing to two circumstances; one, that ether inhaled from a sponge reaches the lungs

mixed with a larger proportion of atmospheric air than when it is inhaled from the apparatus; the other, that the sponge can be, at first, held at a little distance from the patient's mouth, and the ether thus entering the throat and lungs largely diluted with atmospheric air, the parts become gradually accustomed to the irritation which it produces, there is much less disposition to cough on the part of the patient, and less danger of producing spasm of the glottis, by which the windpipe might be closed. It can, too, be given more easily from the sponge than the apparatus where the patient is unwilling, or unable, to assist in the process, as in the case of operations on young children, and on the inferior animals in veterinary surgery. The simple sponge can also be easily cleansed, while that which remains in the apparatus must be frequently removed at the expense of considerable trouble, or there is danger of its becoming musty and offensive.

Inhaling ether from a sponge, therefore, may be considered as the most convenient,

safest, and best method of taking it. The sponges best suited to this purpose are whole Turkey sponges, of a conical or bell shape, tapering from the base, which should be from four to six inches in diameter,* up toward the apex. The lower surface, or mouth of the bell, should be sufficiently concave to avoid bringing the sponge in direct contact with the lips.

Before going on to speak of the mode of administering ether, and to describe the effects produced by it, it is proper to state that it is not necessary for patients who take it for different purposes to be all put in precisely the same condition. That is, it is not necessary that all who take it should be brought equally under the influence of the ether, but that different degrees of etherization should be produced, according to the end proposed to be effected in different classes of cases. For instance; most surgical operations occupy a longer time than

* Sponges, answering this description, may be found at almost any apothecary's shop, and, if made expressly for the administration of ether, could not be better adapted to the purpose. They should be of good quality, and carefully freed from sand, &c., before they are used.

does the extraction of teeth, and the pain is, necessarily, of longer duration; of course, then, a patient must be brought more completely under the influence of ether to render him insensible to pain which is to last a number of minutes, than is necessary to prevent him from feeling that which lasts only a few seconds. There are some conditions, too, usually attending operations in dentistry, which do not belong to most operations in surgery. Teeth are usually extracted at the house of the dentist, and the patient expects, as soon as the tooth is out, to be able to leave the room, and go about his ordinary avocations. Now this may be done in a large majority of the cases where teeth are extracted while the patient is under the influence of ether, provided, only enough has been given to render him insensible to the short, and comparatively slight pain caused by the extraction of a tooth, and not as much as is required to prevent him from feeling a severe surgical operation. Many dentists have, no doubt, been prevented from using ether from a fear that its effects,

after the tooth was extracted, would prove annoying both to themselves, and their patients; which fear arose, I think, from an erroneous belief that a patient must be brought as much under the influence of ether to have a tooth extracted, as to undergo the amputation of a limb. That some cases have occurred where nausea and vomiting have followed the use of ether,* I have neither the wish, nor the intention, to deny; but they are by no means frequent, and have never, to my knowledge, been followed by any permanent ill effects. Ought we then to be deterred from using ether, which we know to be an antidote to a positive evil, pain, from the fear of consequences which but rarely follow its use, and which, when they do occur, seem to be of little moment?

Having made the necessary previous examination, decided upon the operation to be performed, and arranged the instruments near at hand, so as to lose no time when the ether takes effect, proceed as follows. Place

* The same result also follows the excessive use of alcoholic drinks.

your patient in the position which he is to occupy during the operation, (which position should be made as comfortable as possible,) and direct him to close his eyes, and remain perfectly still. Direct, also, any one who may be present to say nothing to the patient, as talking materially retards the process. Where a tooth is to be extracted, or any operation performed upon the mouth, the patient should be directed to inhale the ether with his mouth open; for, if he commences this process with his mouth closed, he will sometimes keep it firmly shut after he is under the influence of the ether. Should the patient, at any time, close his teeth in this way, the operator must press the palm of his left hand firmly upon the patient's forehead, so as to fix the head steadily against the head-piece of the chair, then, placing his right hand upon the chin, overcome the resistance of the muscles by a sudden, but firm, downward pressure. Having made these preparations, pour upon the inside of such a bell-shaped sponge, as I have above described, two ounces of pure

sulphuric ether; then bring the hollow part of the sponge to within an inch of the patient's mouth, and allow him to take four or five inspirations with it in this position. If no cough is produced, the sponge may then be applied so as to cover the nose and mouth of the patient, so that all the air he breathes must pass through it. If any cough is produced by the first breathing of the ether, the sponge should not be applied so as to cover the mouth and both nostrils, but should be inclined a little to one side, so that one nostril may remain open for the air to pass through, until the patient becomes so accustomed to the ether that it does not produce coughing. Any forced or irregular breathing should be discouraged, and the patient told to breathe in a steady, regular, and natural manner.

Inhalation should be thus persevered in for three minutes, without any thing being said to the patient, unless there is reason to believe, before that time, that he is under the influence of the ether; this can only be known by carefully observing the symptoms

of etherization. These are,* redness of the countenance, dilatation of the pupils, which are also sometimes fixed or turned up, increased action of the heart, so that the pulse is quicker, and usually fuller, relaxation of the muscles generally, (sometimes accompanied by a flow of saliva from the corners of the mouth,) and finally, loss of consciousness, and slowness of the pulse. It is not necessary, nor is it desirable, that, in every case where ether is inhaled, the patient should exhibit all these symptoms. When, therefore, a dentist is giving ether to a patient, for the purpose of extracting a tooth, if, at the end of a minute from the time when the sponge is placed at the patient's lips, he perceives that the countenance is flushed, the pulse quickened, and, particularly, if there is any relaxation of the muscular system, (which, I think, first manifests itself in a heavy drooping of the eyelids, similar to that which precedes natural

* This is the usual appearance, although the countenance is sometimes pale; but this can easily be distinguished from the purple or livid appearance which too long a use of the ether produces.

sleep,) he should be told to open his eyes. If the patient opens his eyes quickly, and if, when he does so, the pupils appear clear, bright, and natural, he should be directed to close them again, and nothing more should be said to him until another minute has elapsed, when the same process should be repeated. If, on the contrary, when the patient is directed to open his eyes, he either neglects doing so entirely, or else partially raises the lids in a heavy, languid manner, disclosing dilated pupils, with a dull, lack-lustre expression, he should be asked whether he will have his tooth extracted; if he makes no reply, or drawls out a slow, hesitating assent, the instrument should be applied, and the tooth extracted immediately. This may surprise those dentists who are not in the habit of using ether; but I assure them that patients frequently retain sufficient consciousness to comprehend what is said to them, and even to express their willingness to have a tooth extracted, although, when it is done, they feel no pain. Sometimes, when

in this state, they know when the instrument is applied, and know that a tooth is extracted, but regard it as belonging to some one else; or, if they are aware that it is their own, declare that it causes them no pain. Sometimes a patient will scream when a tooth is extracted, and very frequently will raise his hand to his head when the instrument is applied to it; but these must not be considered as indications that he is conscious of suffering, for I have very often had patients do so, and yet declare, when they fully recovered, that they had felt no pain.* As patients, however, sometimes seize the hand or instrument of the operator, and thus prevent the extraction of the tooth, it is well to have an assistant near, who can hold the hands of the patient if necessary; and those persons who appear to be uneasy and restless while inhaling ether, should be directed to grasp firmly the

* Sometimes, where it has been necessary to extract several teeth, when I have removed one, I have had the patient say to me, "be quick," "be quick," and yet declare positively, when he recovered, that he had felt no pain.

hands of an assistant, as this frequently tranquillizes and quiets them.

By carefully following the above directions, dentists may be assured that they will rarely fail to render their patients insensible to the extraction of teeth, and will usually be able to do this in from one to three minutes. If the ether does not take effect in three minutes, they will please to follow the directions given below for administering it in surgical operations; excepting, that a dentist need not wait until the patient does not open his eyes when directed to do so, but may proceed to extract the tooth, if the patient opens his eyes in the heavy, languid manner, or speaks in the slow, drawling tone, before described.

I should mention here, that it has been proposed, and practised, to allow patients to inhale ether with the eyes open, in order to observe the effect which it produces upon the pupils, and judge of the time for extracting the tooth by the appearances which they present. I have tried this method, but, on the whole, prefer the one which I

have mentioned above, as being more certain.

When a surgical operation is to be performed, the inhalation should be steadily continued for three minutes without speaking to the patient. If, at the end of this time, the pulse is quickened, and the muscles relaxed, so that the head has a tendency to fall on one side, the patient should be told, in a loud, distinct tone, to open his eyes; and, if he does *not* do so, the operation should be immediately commenced. If he does open his eyes, even in a slow and languid manner, he should be directed to close them, and the inhalation should be continued two minutes longer, when the same question may be repeated; and it will usually be found that, by this time, the patient is unconscious. Should this not occur, however, the surgeon should place his hand over about one half of the sponge, so as to prevent loss of ether by evaporation, and continue the inhalation until ten minutes have elapsed from the time when the patient

first began to breathe it; calling upon him to open his eyes at intervals of about one minute each.* If, at the end of ten minutes, he still continues to open his eyes, when directed to do so, the inhalation should be discontinued, and not resumed again for at *least* five minutes. At the end of that time, two ounces more of ether should be poured upon the sponge, and the inhaling resumed as before; but if, after inhaling a second time for ten minutes, it does not produce its effect, an *interval* of *ten* minutes must be allowed to the patient, and then, the ether having been again renewed, the inhaling may be resumed once more. If, at the end of the third trial of inhaling ether, the patient still remains unaffected by it, the operation had better be deferred until another day; but I can hardly suppose that this will ever happen where the ether is pure and highly concentrated,

* Throughout the whole of the inhalation, the operator should bear constantly in mind the symptoms indicating danger, which I give below, page 39, and remove the sponge from the patient's mouth as soon as any of them appear.

and has been administered in the manner above described.

In the course of inhaling it, frequently more ether is required than has been at first poured upon the sponge. No certain rule can be given as to the amount to be added in these cases, as the evaporation, and of course the waste of ether, is so much greater in warm weather than cold. If, however, the operator perceives that the sponge has lost its moist and cold feeling, and does not give off the ethereal vapor as freely as before, he should pour upon the upper part of the sponge, without removing it from the patient's mouth, from half an ounce to an ounce of ether.* In long operations, it is frequently necessary to repeat the inhalation, after the patient has once become insensible, for fear that he should recover his consciousness before the operation is concluded. If, then, the patient

* The ether produces the most powerful effect when poured upon the inside of the sponge, as at first directed; but as, after the sponge has been once applied, this occasions some loss of time, it is found most convenient to pour it on the top of the sponge, without removing it from the mouth.

should appear, from his motions, or groans, to be recovering his consciousness before the operation is finished, the sponge should be re-applied to the mouth as it is, if it appears to be tolerably moist; and, if it is dry, half an ounce of ether, poured upon the inside of it, will enable the patient, by four or five inspirations, to resume his state of entire unconsciousness.

Before leaving this part of the subject, I wish all who make use of ether, distinctly to understand, that I by no means consider it necessary that patients should, in every instance, inhale it for so long a time as ten minutes. Some patients have remained insensible to the pain of severe surgical operations, after an inhalation of only three minutes, many after one of five minutes, and most require but eight minutes. I wish, therefore, ten minutes to be considered as the *longest* time that the inhalation should last, without removing the sponge from the patient's mouth; and I feel satisfied that, if it be administered according to the directions, very few cases will occur

which will render it necessary to continue the inhalation so long as ten minutes.

The next class of cases differ, in one important particular, from those before mentioned. This is, that, in those cases of which I have already spoken, ether is given to patients before they are subjected to pain, in order to render them insensible to it when it does come; but, in those of which I am about to speak, it is given to relieve them of pain which they already suffer. The cessation of pain, then, in these cases, is the best indication for suspending the use of ether.

First in importance among this class are, the pains of child-birth. When the use to which sulphuric ether is now principally applied, was first made known, it was not at once perceived that it exerted its influence over the voluntary muscles alone. Before long, this fact was noticed, and it was then proposed to administer it in cases of midwifery, the expulsion of the child depending chiefly upon the involuntary contractions of

the womb. It was at first supposed that ether would be mostly used in cases of preternatural labor, where it was necessary to turn the child; or where instruments were to be used. It was, however, soon after, administered in cases of natural labor, and was found to save the mother from suffering, without injuring the child, or retarding its progress into the world. As soon as this fact was known, many physicians eagerly availed themselves of this means of relieving those sufferings, which they had before been compelled to witness, without the power of mitigating. The cases of midwifery in which ether has been employed, although not numerous when compared with those in which it has been used for other purposes, are still many;* and the very fact, that no fatal or even injurious

* To say nothing of the experience of other physicians in the use of ether for cases of midwifery, Prof. Simpson, of Edinburgh, bad, up to March 22d, "used etherization some forty or fifty times, with the most perfect safety and success."—(British and Foreign Med. Review, No. 46, p. 568.) Since this date, I believe that Dr. Simpson has added largely to his number of cases, but I have not seen any report of them.

consequences have been made public, as having been caused by its use, at a time when the medical profession is every where so much interested upon this subject, and so desirous of adding to the common stock of information, affords good ground for belief that it never has produced such consequences.

Having decided upon giving ether in a case of labor, the first point to be settled is, at what time shall its administration be commenced. Most cases of labor begin, as is well known, by wandering pains, extending from the loins and back across the abdomen to the pubes; but these are not at first severe, and, being followed by intervals of ease, during which the patient can frequently sleep, not hard to bear. The pains which follow these, and which attend the dilatation of the orifice of the womb, are of a cutting, grinding character, and frequently cause extreme suffering. Is it, then, advisable to administer ether at this time? In those cases where these pains are not very

severe, and, particularly, in cases of first children, when a somewhat long labor is usually to be expected, it will perhaps be well to avoid giving ether; as, after a woman has once taken it, and experienced the relief which it affords to her sufferings, she is unwilling afterward to bear a single pain without it, and we may thus be compelled to give more than we wish to. If, however, the patient undergoes the severe distress which frequently accompanies these cutting, grinding pains, we should be cruel to deprive her of a remedy which we actually hold in our hands, and which we have known to be administered freely, in many instances, without having ever known of a single evil result which could be justly attributed to it. Patients should therefore be encouraged to bear the less severe pains with fortitude, while the worst ones should be relieved by ether. When the orifice of the womb is well dilated, and the head of the child pressing down with steady, regular, well-sustained, expulsive pains, there can be no

doubt of the propriety of administering ether; and it may be continued, for most of the severe pains, until the child is born. If the accoucheur has any doubt whether the pains advance the child as much with the ether as without it, he should allow the patient to go through two or three pains without ether, until he has satisfied himself on this point. In most cases, he will find, owing to the relaxing power which the ether exerts upon the muscles, thus diminishing the resistance to the child's head, that the labor advances rather more rapidly, when a patient is under its influence, than when she is not. When the accoucheur administers it the first time, the patient had better sit up in bed; he will thus be able to observe exactly the time which the ether takes to produce its effect, for the patient not only ceases to complain, but sinks quietly back on the pillow, as soon as the pain is relieved. The ether is to be administered in the manner before described, one ounce of it only being poured upon the inside of the sponge; but, as in this instance, the

cessation of pain is the indication to cease using the sponge, it is seldom necessary to apply it longer than from one to three minutes. After a patient has been once brought under the influence of ether, a few inspirations will usually relieve her of the subsequent pains; and this, too, often from the sponge used before, without adding to it any more ether, or only one or two teaspoonfuls. As a patient usually drops her hand, if it be elevated, when she has inhaled enough ether to be insensible to pain, it is best, in most cases in this stage of labor, to allow her to hold the sponge herself, and apply it to her mouth when she feels a pain coming on. An assistant should, however, in this case, be stationed at the bedside, with directions to remove the sponge from her mouth, as soon as she is insensible, if she does not do it herself. When the head of the child is about to pass through the external organs, it is best, after allowing the patient to inhale ether till she is insensible to the pain, to entrust the sponge to the care of the assistant, with di-

rections to allow the patient to take a few inspirations from it, if she seems about to recover her consciousness before she is delivered.

In those cases of midwifery where it is necessary to apply the instruments, or to turn the child, the ether should be given in the same manner as where a surgical operation is to be performed.

The mode of administering ether in cases of colic, cramp, or the passage of renal calculi along the ureters, is similar to that which I have described as applicable to cases of midwifery; the cessation of pain being the principal indication for suspending its use. Still, it must not be forgotten in these cases, as well as in those of midwifery, that there are other symptoms,* beside the cessation of pain, which indicate that the use of ether should be immediately suspended.

When ether is given to assist the surgeon in returning a strangulated hernia, reducing a dislocation, or adjusting the bones in a bad case of fracture, it is to be

* See page 39.

administered in the manner described as appropriate to surgical operations; and persevered in until complete muscular relaxation ensues, unless the symptoms indicating danger should occur. An inhalation of from three to five minutes will usually be found sufficient in these cases.

Without going minutely into the effect produced on the brain and nervous system by inhaling sulphuric ether, it is sufficient to say that it is a kind of intoxication which is complete while it lasts, which usually comes on and passes off with equal rapidity, and without leaving the ill effects of ordinary intoxication. This seems to be owing to the mode it is administered, that is by inhalation, and not by being taken into the stomach. For when the lungs are filled with the ethereal vapor, it is necessarily brought in contact with the innumerable blood-vessels which ramify through every part of them; the vapor is taken into the circulation by direct absorption, and, being sent to the brain, produces immediate intoxication. The recovery is equally rapid,

because, when the effect of the vapor first inhaled passes away, and the sponge is removed from the mouth, there being no more vapor to be taken into the circulation, the patient necessarily recovers. An intoxicating liquor, on the contrary, when taken into the stomach, is slower in producing its effects, as it must get into the circulation by the ordinary process; and the effects last longer, because intoxication continues while any of it remains in the stomach to be absorbed. It has been long known, that a person in a state of complete intoxication, is insensible to the pain of a surgical operation;* and it is probable that patients would have been intoxicated in the ordinary manner, before performing operations upon them, had it not been thought that the amount of spirituous liquor, necessary to produce perfect intoxication, would injure the health of the patient, and so re-

* In January last, a patient was brought to the Massachusetts General Hospital, in a state of complete intoxication, whose leg was so badly crushed as to require amputation; this was performed soon after he entered, without his being at all aware of it.

tard his recovery. The inhalation of sulphuric ether answers perfectly the desired end, as it intoxicates speedily and completely, and, when the inhalation is discontinued, its effects rapidly pass away.

As, then, the effects produced by inhaling ether are similar to those caused by taking alcoholic drinks into the stomach, so the results of too long an inhalation of ether, as shown in experiments on the inferior animals, seem to resemble those produced by an excessive use of alcohol. When a person has taken alcohol to intoxication temporary insensibility, as is well known, usually ensues; and a similar condition is induced when ether is fully inhaled, although it does not last so long. If a person takes an excessive amount of alcohol into the stomach, the blood-vessels of the brain may become permanently congested, or even ruptured, or the blood may be so overcharged with alcohol, as to exert a poisonous influence on the brain and nervous system, and prostration, coma, and death ensue. It would, doubtless, be pos-

sible to give ether long enough to produce the same result; but with an agent, the effect of which is so quickly manifested, passes away so rapidly, and is thus so completely under our control, as sulphuric ether, any fatal result in administering it to the human race can hardly be anticipated, if proper precautions are taken. And I am confident, that any one who wishes to make use of it, if he will administer it exactly according to the directions given above, and will pay attention to the symptoms of danger which I am now about to detail, may give it without endangering the safety of his patients.

If, then, at any time during the administration of sulphuric ether, (even if the patient has but just begun to inhale it,) the countenance should become of a livid, purplish hue; the breathing labored, and stertorous or snorting; if the pulse, in an adult, fall to sixty-five, or, in a child above ten years of age, to seventy, or, under ten, to eighty, the inhalation must be *immediately* discontinued. It is of no consequence whether the inhala-

tion has rendered the patient insensible or not; if any of these symptoms appear, the sponge must be immediately removed from the mouth; and if the pulse does not rise, the color come back to the face, and the breathing become natural, cold water must be dashed into the face, strong aqua ammonia (which should be always kept at hand) applied to the nostrils, and ten drops of it in a wine-glass of water given internally. If this does not arouse the patient, he should be taken up, if possible, and walked about the room, with a person supporting him under each arm, while the affusion of cold water, application of aqua ammonia to the nostrils, and administering it internally, still go on. It has been suggested to employ electro-magnetism for the recovery of patients from the effects of ether. I have never used it myself, but should advise its trial, where other means have failed, as it has been found by M. Ducros to arouse chickens and pigeons immediately from the stupor which the inhalation produced. A current of positive electricity passed into

them when they were upon the isolating stool roused them in about thirty seconds; but the negative electricity prolonged the insensibility instead of abridging it.*

But these remarks must be understood to apply to extreme cases, which can hardly be supposed to occur, if proper caution is used. Ether, like alcohol, may be taken to a dangerous extent; but if the abuse of a thing is to be regarded as an argument against its careful and judicious use, many articles of almost daily domestic consumption must be immediately discarded.

Some caution ought to be observed as to the state of the health of patients, before

* See London Medical Gazette, May, p. 829. The London Lancet, July 24th, p. 101, states, that M. Ducros has rendered patients insensible to the extraction of teeth by the electro-magnetic current. In order to try these experiments, I applied the wires of an electro-magnetic apparatus of considerable power to the thigh of a chicken, from which the feathers had previously been removed, and allowed the electric current to pass through it for five minutes; I then cut through the thigh to the bone without any evidence of pain being given at the part of the animal, although, when the other leg was slightly pricked, it quickly withdrew it. Similar experiments were tried, with the same results, upon a frog and a squirrel.

administering ether to them. It will be proper to ascertain whether they have ever had hæmorrhage from the lungs, epilepsy, disease of the heart, or a tendency to apoplexy, and, in such cases, the operator should decline giving ether.* In persons of great nervous excitability also, particularly females, it should not be given for slight causes.

The age of a patient was at first thought worthy of consideration in administering ether, and I at first declined, in most instances, giving it to young children. More extended observation has convinced me that it may be done with perfect safety; and a severe operation has, within a few weeks, been performed at the Massachusetts General Hospital, on an infant, three months old, whose sufferings were very much mitigated by the use of ether.

* I think it, however, proper to state, that, since September last, I have made daily use of it, both in my own practice and in that of others, and, in many cases, without knowing the state of the patient's health in these respects, and I have never had any case where the patient, to my knowledge, experienced any permanent ill effects from its use.

As to the effect ether produces on persons in the habit of freely using ardent spirits, I should say, judging from the cases where patients acknowledged this to be the case, (which are not frequent,) that the specific effects of ether may always be produced upon them, but not in so short a time as in other cases.

When the present use of ether first attracted attention it was feared that its vapor, mingling with the atmosphere of the room, would form a dangerous explosive mixture, which would ignite when exposed to the flame of a candle. To obviate this danger, it was proposed that Sir H. Davy's safety-lamp should be used whenever ether was to be inhaled at night. To satisfy myself upon this point, I placed an ounce of ether upon a shovel, fastened to a pole eight feet long; I then placed the shovel under a lighted gas lamp, so that the ethereal vapor was exposed to its blaze; and, finding that it did not ignite, I inhaled it for a minute or two, and found that I could

breathe directly against the flame of a lamp without any danger. I afterward held a lighted paper over a saucer of ether, and found that, at the distance of two inches, no effect was produced, but, that when the flame was brought within half an inch of the ether, it immediately ignited. From these experiments, I conclude that the evil results to be dreaded from this source have been very much overrated, but that it will be proper to avoid bringing a lighted lamp very near to the patient, or the bottle of ether, when using it at night.

Having now finished the various subjects upon which I proposed to speak, I will conclude by expressing my firm belief that, if any one will make use of ether in the manner I have described, he will find that he can thereby greatly increase the comfort, and relieve the sufferings of his patients, without endangering their safety.

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